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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/696,619	10/25/2000	Tetsuo Tsutsui	SEL 220	3946

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Cook Alex McFarron Manzo
Cummings & Mehler Ltd
200 West Adams Street
Suite 2850
Chicago, IL 60606

EXAMINER	
COLON, GERMAN	
ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 10/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/696,619	TSUTSUI ET AL.	
	Examiner	Art Unit	
	German Colón	2879	

-- The MAILING DATE of this communication appears on the cover sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *0803* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 11, 2003 has been entered.

Response to Amendment

2. The Amendment, filed on August 28, 2003, has been entered and acknowledged by the Examiner.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antoniadis et al. (US 6,366,017) in view of Onitsuka et al. (US 6,049,167).

Regarding claim 1, Antoniadis discloses a light-emitting device comprising: an opaque electrode **12** over a substrate **10**; an EL layer **16** over the opaque electrode; and a transparent electrode **20** over the EL layer; wherein each of said EL layer **16** and said transparent electrode

20 has a film thickness in which there is no occurrence of a guided light. Antoniadis fails to disclose "an inert gas filled in a space between the transparent electrode and a cover material".

However, in the same field of endeavor, Onitsuka discloses an EL device comprising an EL layer being sandwiched between a transparent electrode and an opaque electrode, where an inert gas fills a space between the transparent electrode and a cover material, with the purpose of avoiding the presence of moisture that can cause separation between the EL layer and the electrode layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission (see Col. 1, lines 27-32). Therefore, it would have been obvious to anyone of ordinary skill in the art at the time the invention was made to use Onitsuka's teachings to improve the EL device of Antoniadis, in order to avoid moisture that can cause separation of the EL and electrodes layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission. Antoniadis-Onitsuka discloses a light generated in said EL layer being emitted to the cover material side.

Regarding claim 2, Antoniadis-Onitsuka discloses an EL device wherein the thickness (d) of the EL layer and transparent electrode satisfies a formula $d \leq \lambda/(4n)$ when a light with a wavelength "λ" generated by the EL layer passes through a medium with a refractive index "n". The Examiner notes that the claim does not make reference to a particular wavelength; accordingly, any wavelength can exemplify the claimed wavelength. Antoniadis-Onitsuka teaches the EL layer made of either Alq3 [n=1.7] (see '017, Col. 3, lines 21-24) and the transparent electrode made of ITO [n=1.95] (see '017, Col. 3, line 55 and Col. 4, line 12). The preferred thickness of the EL layer is 100 nm (see '017, Col. 5, line 55) and that of the transparent electrode ranges from 1-50 nm (see '017, Col. 3, lines 55-57). The disclosed

thickness values satisfy the claimed thickness equation (where d≤ 103 nm for Alq3 and d≤ 90 nm for ITO, for a wavelength in the red spectrum of 700 nm).

Referring to claim 3, Antoniadis discloses a light-emitting device comprising: an opaque electrode **12** over a substrate **10**; an EL layer **16** over the opaque electrode, said EL layer having a light-emitting material; a transparent electrode **20** over the EL layer; and a buffer layer **18** (or **14**) provided between said light-emitting layer and said transparent electrode or between said light-emitting layer and said opaque electrode; wherein each of said EL layer **16** and said transparent electrode **20** has a film thickness in which there is no occurrence of a guided light. Antoniadis fails to disclose "an inert gas filled in a space between the transparent electrode and a cover material".

However, in the same field of endeavor, Onitsuka discloses an EL device comprising an EL layer being sandwiched between a transparent electrode and an opaque electrode, where an inert gas fills a space between the transparent electrode and a cover material, with the purpose of avoiding the presence of moisture that can cause separation between the EL layer and the electrode layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission (see Col. 1, lines 27-32). Therefore, it would have been obvious to anyone of ordinary skill in the art at the time the invention was made to use Onitsuka's teachings to improve the EL device of Antoniadis, in order to avoid moisture that can cause separation of the EL and electrodes layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission. Antoniadis-Onitsuka discloses a light generated in said EL layer being emitted to the cover material side.

Referring to claim 4, claim 4 is rejected over the reasons stated in the rejection of claim 2 above.

5. Claims 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. (US 6,147,451) in view of Onitsuka et al. (US 6,049,167), further in view of Codama (US 6,091,078) and Arai (US 6,163,110).

Regarding claim 5, Shibata discloses a light-emitting device having a pixel portion comprising a semiconductor device and an EL element electrically connected to the semiconductor device formed on a substrate (see Fig. 5 and Col. 3, lines 33-38), said EL element comprising:

an opaque electrode **22**; an EL layer **23** over the opaque electrode; and a transparent electrode **24** over the EL layer. Shibata fails to disclose "an inert gas filled in a space between the transparent electrode and a cover material".

However, in the same field of endeavor, Onitsuka discloses an EL device comprising an EL layer being sandwiched between a transparent electrode and an opaque electrode, where an inert gas fills a space between the transparent electrode and a cover material, with the purpose of avoiding the presence of moisture that can cause separation between the EL layer and the electrode layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission (see Col. 1, lines 27-32). Therefore, it would have been obvious to anyone of ordinary skill in the art at the time the invention was made to use Onitsuka's teachings to improve the EL device of Shibata, in order to avoid moisture that can cause separation of the

EL and electrodes layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission.

Shibata-Onitsuka discloses an EL layer made of N,N'-Diphenyl-N,N'-di(α-naphthyl)benzidine (see '451, Col. 5, lines 21-22) with a thickness of 20 nm (see '451, Col. 4, line 60) and a transparent electrode made of ITO (see '451, Col. 4, lines 62-63). Shibata-Onitsuka is silent regarding the index of refraction of the EL layer and the thickness of the transparent electrode.

However, Codama discloses an EL device with a transparent electrode made of ITO with a thickness of 10-500 nm, and especially about 30-300 nm, and teaches that too thick electrodes can give rise to problems including peeling, poor workability, stress failure, low light transmittance and leakage due to surface roughness. Further, Codama teaches that too thin electrode is undesirable in film strength during manufacture, hole transporting capabilities and electric resistance (see '078, Col. 12, lines 25-34). In the same field of endeavor, Arai discloses an EL device with an organic light-emitting layer and teaches that organic EL layers usually have a refractive index of about 1.6-1.8, with an average of 1.7 (see '110, Col. 2, lines 40-42) and further teaches that with such an index of refraction, mass production of EL devices with fluctuations in light emission luminance from device to device is reduced, avoiding use of additional equipment for luminance control which provides a decrease in cost of the product and an increase in production efficiency (see '110, Col. 1, lines 30-42, 55-56, 62-67; and Col. 2, lines 1-16). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Codama's teachings of providing a transparent electrode made of ITO with a thickness of 10-500 nm (30-300 nm); and Arai's teachings of an organic EL layer with an

index of refraction of 1.6-1.8 (1.7), with the purpose of (1)avoiding problems including peeling, poor workability, stress failure, low light transmittance and leakage due to surface roughness, undesirable film strength during manufacture, hole transporting capabilities and electric resistance of the transparent electrode; and (2)reducing fluctuations in light emission luminance from device to device in mass production, avoiding use of additional equipment for luminance control which provides a decrease in cost of the product and an increase in production efficiency.

Shibata-Onitsuka in view of Codama-Arai discloses an EL layer and a transparent electrode having a film thickness in which there is no occurrence of guided light and wherein a light generated in said EL layer is emitted to the cover material side.

Regarding claim 6, Shibata-Onitsuka-Codama-Arai discloses an EL device wherein the thickness (d) of the EL layer and transparent electrode satisfies a formula $d \leq \lambda/(4n)$ when a light with a wavelength "λ" generated by the EL layer passes through a medium with a refractive index "n". The Examiner notes that the claim does not make reference to a particular wavelength; accordingly, any wavelength can exemplify the claimed wavelength. Shibata-Onitsuka-Codama-Arai teaches the EL layer with [n=1.7] (see '110, Col. 2, lines 40-42) and the transparent electrode made of ITO [n=1.95] (see '451, Col. 4, lines 62-63). The preferred thickness of the EL layer is 20 nm (see '451, Col. 4, line 60) and that of the transparent electrode ranges from 30-300 nm (see '078 Col. 12, line 27). The disclosed thickness values satisfy the claimed thickness equation (where $d \leq 103$ nm for n=1.7 and $d \leq 90$ nm for ITO, for a wavelength in the red spectrum of 700 nm).

Referring to claim 7, Shibata-Onitsuka-Codama-Arai discloses a light-emitting device having a pixel portion comprising a semiconductor device and an EL element electrically

connected to the semiconductor device formed on a substrate (see '451, Fig. 5 and Col. 3, lines 33-38), said EL element comprising:

an opaque electrode **22**; an EL layer **23** over the opaque electrode; and a transparent electrode **24** over the EL layer; an inert gas fills a space between the transparent electrode and a cover material (see '167, Fig. 1); a buffer layer provided between said light-emitting layer and said transparent electrode or between said light-emitting layer and said opaque electrode (see '451 Fig. 5 in view of Fig. 6), wherein each of said EL layer **23** and said transparent electrode **24** has a film thickness in which there is no occurrence of a guided light. Shibata-Onitsuka in view of Codama-Arai discloses an EL layer wherein a light generated in said EL layer is emitted to the cover material side. Same reason for combining stated in claim 5 applies.

Referring to claim 9, Shibata-Onitsuka-Codama-Arai discloses a light-emitting device having a pixel portion comprising:

a plurality of opaque electrodes **22** arranged in stripe shapes over a substrate (see '451, Fig. 9); an EL layer **23** over the plurality of opaque electrodes; a plurality of transparent electrodes **24** (see '451, Fig. 9 in view of Fig. 8) over the EL layer, the plurality of transparent electrodes provided in stripe shapes so as to be orthogonal to the plurality of opaque electrodes; and an inert gas fills a space between the transparent electrode and a cover material (see '167, Fig. 1), wherein each of said EL layer **23** and said transparent electrode **24** has a film thickness in which there is no occurrence of a guided light. Shibata-Onitsuka in view of Codama-Arai discloses an EL layer wherein a light generated in said EL layer is emitted to the cover material side. Same reason for combining stated in claim 5 applies.

Regarding claim 11, Shibata-Onitsuka-Codama-Arai discloses a light-emitting device having a pixel portion comprising:

a plurality of opaque electrodes **22** arranged in stripe shapes over a substrate (see '451, Fig. 9); an EL layer **23** over the plurality of opaque electrodes; a plurality of transparent electrodes **24** (see '451, Fig. 9 in view of Fig. 8) over the EL layer, the plurality of transparent electrodes provided in stripe shapes so as to be orthogonal to the plurality of opaque electrodes; and an inert gas fills a space between the transparent electrode and a cover material (see '167, Fig. 1), a buffer layer provided between said light-emitting layer and said transparent electrode or between said light-emitting layer and said opaque electrode (see '451 Fig. 5 in view of Fig. 6), wherein each of said EL layer **23** and said transparent electrode **24** has a film thickness in which there is no occurrence of a guided light. Shibata-Onitsuka in view of Codama-Arai discloses an EL layer wherein a light generated in said EL layer is emitted to the cover material side. Same reason for combining stated in claim 5 applies.

Regarding claims 8, 10 and 12, claims 8, 10 and 12 are rejected over the reasons stated in the rejection of claim 6.

Response to Arguments

6. Applicant's arguments filed August 28, 2003 have been fully considered but they are not persuasive.

i. Applicant argues that the cited references cannot be combined. Specifically, that Onitsuka (US 6,049,167) discloses a configuration wherein light emanates on a substrate side while Antoniadis et al. (US 6,366,017), Shibata et al. (US 6,147,451) and Codama (US

6,091,078) disclose a configuration wherein light emanates in a direction opposed to the substrate. Further, applicant argues that the order of the electrodes of Antoniadis, Shibata and Codama must be changed to apply the teachings of Onitsuka.

Antoniadis, Shibata and Codama disclose a light-emitting device having a substrate, an opaque electrode over the substrate, an EL layer and a transparent electrode. Said references are silent regarding the light-emitting device further comprising a cover material and a gas.

The Examiner notes that the Onitsuka reference is *relied upon* for the teachings of a cover and a gas to avoid moisture that can cause separation of the EL and electrodes layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission. Onitsuka discloses a glass, i.e. transparent, material for the cover (see Col. 5, line 6); accordingly, the use of the cover would not hinder the light emission from the top electrode layer of either Antoniadis or Shibata. For that reason, the electrode layers of Antoniadis (or Shibata) require no change in location. Upward light emission would be contemplated by the combination of either Antoniadis or Shibata with Onitsuka.

Further, while Onitsuka exemplifies an OLED having a transparent electrode over a substrate, the teachings are not limited to such an arrangement (see for example claim 1 of the '167 reference). Rather, the teachings are akin to the detrimental effects of moisture to all layers forming the EL structure (electrodes, HTL, EL, ETL) of an organic EL element and the advantage of providing a cover and a gas.

ii. Applicant argues that the cited references fail to disclose or suggest a film thickness of the EL layer and transparent electrode in which there is no occurrence of a guided light.

The Examiner notes that a guided light will occur if each of the EL layer and the electrode layer has a thickness d greater than $\lambda/(4n)$, when a light with a wavelength "λ" generated by the EL layer passes through a medium with a refractive index "n". As stated on the rejection of claims 2, 4, 6, 8, 10 and 12, the cited references disclose each of the EL layer and the transparent electrode having a thickness d that satisfies the above conditions for at least a wavelength in the red spectrum of 700 nm.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to German Colón whose telephone number is 703-305-5987. The examiner can normally be reached on Monday thru Friday, from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 703-305-4794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Joseph Williams

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